

APPLICATION FOR  
UNITED STATES LETTERS PATENT

FOR

METHOD OF AGGREGATING AND DISTRIBUTING INFORMAL AND FORMAL  
KNOWLEDGE USING SOFTWARE AGENTS

By:

MARK HALL

Certificate under 37 CFR 1.10 of Mailing by "Express Mail"

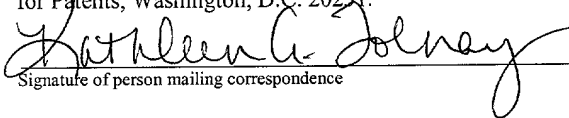
EL 750735715 US

"Express Mail" label number

August 24, 2001

Date of Deposit

I hereby certify that this correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.



Signature of person mailing correspondence

Kathleen A. Tolnay

Typed or printed name of person mailing correspondence

"TOLSON" T 4585660

## RELATED APPLICATIONS

The present invention is a continuation-in-part of Provisional Serial No. 60/230,962 filed on September 7, 2000, which is a continuation-in-part of U.S. Provisional Serial No. 60/130,843 filed on April 22, 1999 that matured into U.S. Non-Provisional Serial No. 09/553,675 filed on April 21, 2000. The content of these applications is incorporated herein by reference.

### Technical Field Of The Invention

The present invention relates to a method of knowledge management by controlling the aggregation or dissemination of information from numerous disparate sources including organizational databases of informal knowledge and databases of formal educational content and delivering such content to an end user in real time and “batch” modes of delivery. In addition to content, the method links the content to required or optional products that are useful to the end user.

### Background Of The Invention

Knowledge management incorporates two distinct areas of information: formal knowledge (e.g., educational classes, courses, training, and certificate or degree programs) and informal knowledge (that which is accumulated within an organization or institution by its members – for instance, what is the best method sales support by an organization’s staff)

Informal, or institutional knowledge, is an increasingly important asset to a variety of organizations. As employees grow older and retire, much of their experience regarding the daily operations of the organization are lost forever. As new employees join the organization, they must be trained and educated in these same operations. the aggregation of informal knowledge into software-driven databases that may be accessible by users or user groups. For example, the military might experience a loss of important repair personnel during wartime. The use of informal knowledge (and formal knowledge such as an online training class) could rapidly provide additional personnel to assume the



## SUMMARY OF THE INVENTION

The present invention relates to a method of aggregating and distributing educational content, organizational knowledge, and related supplies or services using software known as “agents” organized and orchestrated by a controlling software routine. Based on an exchange-based architecture, software agents are remotely installed on the servers of content providers. Some software agents operate autonomously but still managed by the controller software, without installation at the servers of various content providers. At the command of the controller, the agents poll and collect requested content from the content provider. Time sensitive information, for example course cost, prerequisites, instructor, and course availability, among other items, can be collected the user in real time. Data that describe institutional knowledge may also be collected in real time. After receiving the requested content from the agents, the controller distributes the collected content to a client, or group of clients. The information is sorted and selected by applying the rules and standards unique to each client end user or group of end users.

One unique aspect of this invention is to collect the information at a central point such as a single web site aggregator, for example the web site located at www.ed-x.com. This type of site will be generally referred to as the aggregator. The aggregator establishes numerous relationships with both content providers and learning resource providers. The aggregator may also have access to an organization’s databases that store informal or institutional knowledge. The aggregator is accessed by the client software on the end user’s computer through various wired or wireless gateways, such as the Internet or other private or public network. The controller software which is located on the aggregator site’s servers instructs remote agents which are located on specific content provider’s database and network servers, or such agents that may operate autonomously to poll and collect requested data which is then returned to the aggregator for further processing and then on to the end user for interaction. The controller software may furthermore instruct autonomous agents to collect data from public sources (including web pages in HTML and XML formats) according to rules and standards requested by the end user. The aggregator then distributes the requested content to the requesting clients in a specified format. In this manner, informal and formal knowledge is

1 aggregated by the aforesaid software agents, managed by controller software, and  
2 returned to the user or end user group for further interaction according to rules and  
3 standards.  
4

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100  
101  
102  
103  
104  
105  
106  
107  
108  
109  
110  
111  
112  
113  
114  
115  
116  
117  
118  
119  
120  
121  
122  
123  
124  
125  
126  
127  
128  
129  
130  
131  
132  
133  
134  
135  
136  
137  
138  
139  
140  
141  
142  
143  
144  
145  
146  
147  
148  
149  
150  
151  
152  
153  
154  
155  
156  
157  
158  
159  
160  
161  
162  
163  
164  
165  
166  
167  
168  
169  
170  
171  
172  
173  
174  
175  
176  
177  
178  
179  
180  
181  
182  
183  
184  
185  
186  
187  
188  
189  
190  
191  
192  
193  
194  
195  
196  
197  
198  
199  
200  
201  
202  
203  
204  
205  
206  
207  
208  
209  
210  
211  
212  
213  
214  
215  
216  
217  
218  
219  
220  
221  
222  
223  
224  
225  
226  
227  
228  
229  
230  
231  
232  
233  
234  
235  
236  
237  
238  
239  
240  
241  
242  
243  
244  
245  
246  
247  
248  
249  
250  
251  
252  
253  
254  
255  
256  
257  
258  
259  
260  
261  
262  
263  
264  
265  
266  
267  
268  
269  
270  
271  
272  
273  
274  
275  
276  
277  
278  
279  
280  
281  
282  
283  
284  
285  
286  
287  
288  
289  
290  
291  
292  
293  
294  
295  
296  
297  
298  
299  
300  
301  
302  
303  
304  
305  
306  
307  
308  
309  
310  
311  
312  
313  
314  
315  
316  
317  
318  
319  
320  
321  
322  
323  
324  
325  
326  
327  
328  
329  
330  
331  
332  
333  
334  
335  
336  
337  
338  
339  
340  
341  
342  
343  
344  
345  
346  
347  
348  
349  
350  
351  
352  
353  
354  
355  
356  
357  
358  
359  
360  
361  
362  
363  
364  
365  
366  
367  
368  
369  
370  
371  
372  
373  
374  
375  
376  
377  
378  
379  
380  
381  
382  
383  
384  
385  
386  
387  
388  
389  
390  
391  
392  
393  
394  
395  
396  
397  
398  
399  
400  
401  
402  
403  
404  
405  
406  
407  
408  
409  
410  
411  
412  
413  
414  
415  
416  
417  
418  
419  
420  
421  
422  
423  
424  
425  
426  
427  
428  
429  
430  
431  
432  
433  
434  
435  
436  
437  
438  
439  
440  
441  
442  
443  
444  
445  
446  
447  
448  
449  
450  
451  
452  
453  
454  
455  
456  
457  
458  
459  
460  
461  
462  
463  
464  
465  
466  
467  
468  
469  
470  
471  
472  
473  
474  
475  
476  
477  
478  
479  
480  
481  
482  
483  
484  
485  
486  
487  
488  
489  
490  
491  
492  
493  
494  
495  
496  
497  
498  
499  
500  
501  
502  
503  
504  
505  
506  
507  
508  
509  
510  
511  
512  
513  
514  
515  
516  
517  
518  
519  
520  
521  
522  
523  
524  
525  
526  
527  
528  
529  
530  
531  
532  
533  
534  
535  
536  
537  
538  
539  
540  
541  
542  
543  
544  
545  
546  
547  
548  
549  
550  
551  
552  
553  
554  
555  
556  
557  
558  
559  
560  
561  
562  
563  
564  
565  
566  
567  
568  
569  
570  
571  
572  
573  
574  
575  
576  
577  
578  
579  
580  
581  
582  
583  
584  
585  
586  
587  
588  
589  
590  
591  
592  
593  
594  
595  
596  
597  
598  
599  
600  
601  
602  
603  
604  
605  
606  
607  
608  
609  
610  
611  
612  
613  
614  
615  
616  
617  
618  
619  
620  
621  
622  
623  
624  
625  
626  
627  
628  
629  
630  
631  
632  
633  
634  
635  
636  
637  
638  
639  
640  
641  
642  
643  
644  
645  
646  
647  
648  
649  
650  
651  
652  
653  
654  
655  
656  
657  
658  
659  
660  
661  
662  
663  
664  
665  
666  
667  
668  
669  
670  
671  
672  
673  
674  
675  
676  
677  
678  
679  
680  
681  
682  
683  
684  
685  
686  
687  
688  
689  
690  
691  
692  
693  
694  
695  
696  
697  
698  
699  
700  
701  
702  
703  
704  
705  
706  
707  
708  
709  
710  
711  
712  
713  
714  
715  
716  
717  
718  
719  
720  
721  
722  
723  
724  
725  
726  
727  
728  
729  
730  
731  
732  
733  
734  
735  
736  
737  
738  
739  
740  
741  
742  
743  
744  
745  
746  
747  
748  
749  
750  
751  
752  
753  
754  
755  
756  
757  
758  
759  
760  
761  
762  
763  
764  
765  
766  
767  
768  
769  
770  
771  
772  
773  
774  
775  
776  
777  
778  
779  
780  
781  
782  
783  
784  
785  
786  
787  
788  
789  
790  
791  
792  
793  
794  
795  
796  
797  
798  
799  
800  
801  
802  
803  
804  
805  
806  
807  
808  
809  
810  
811  
812  
813  
814  
815  
816  
817  
818  
819  
820  
821  
822  
823  
824  
825  
826  
827  
828  
829  
830  
831  
832  
833  
834  
835  
836  
837  
838  
839  
840  
841  
842  
843  
844  
845  
846  
847  
848  
849  
850  
851  
852  
853  
854  
855  
856  
857  
858  
859  
860  
861  
862  
863  
864  
865  
866  
867  
868  
869  
870  
871  
872  
873  
874  
875  
876  
877  
878  
879  
880  
881  
882  
883  
884  
885  
886  
887  
888  
889  
890  
891  
892  
893  
894  
895  
896  
897  
898  
899  
900  
901  
902  
903  
904  
905  
906  
907  
908  
909  
910  
911  
912  
913  
914  
915  
916  
917  
918  
919  
920  
921  
922  
923  
924  
925  
926  
927  
928  
929  
930  
931  
932  
933  
934  
935  
936  
937  
938  
939  
940  
941  
942  
943  
944  
945  
946  
947  
948  
949  
950  
951  
952  
953  
954  
955  
956  
957  
958  
959  
960  
961  
962  
963  
964  
965  
966  
967  
968  
969  
970  
971  
972  
973  
974  
975  
976  
977  
978  
979  
980  
981  
982  
983  
984  
985  
986  
987  
988  
989  
990  
991  
992  
993  
994  
995  
996  
997  
998  
999  
1000

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are incorporated into and form a part of the specification to provide illustrative examples of the present invention. The drawings together with their description serve to explain the principles of the invention. The drawings are only for purposes of illustrating preferred and alternate embodiments of how the invention can be made and used and are not to be construed as limiting the invention to only the illustrated and described examples.

Various advantages and features of the present invention will be apparent from a consideration of the accompanying drawings in which:

**Figure 1** is a diagram of a network in which the present invention may be implemented;

**Figure 2** is a chart depicting the educational exchange model disclosed herein;

**Figure 3** is a diagram depicting an agent content aggregator as disclosed herein;

**Figure 4** is a flowchart representing the utilization of the educational exchange model disclosed herein;

**Figure 5** depicts an alternative embodiment of the invention disclosed herein; and,

**Figure 6** is a depiction of another alternative embodiment of the aggregator invention disclosed herein.

## DETAILED DESCRIPTION OF THE DRAWINGS

Turning to **Figure 1**, a network diagram in which the present invention may be implemented is shown. **Figure 1** is a pictorial representation of a distributed data processing system. Distributed data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within distributed data processing system **100**. Network **102** may include permanent connections, such as wire or fiber optic cables, or temporary connections made through telephone connections.

In the depicted example, a content provider **104** and learning resource provider **106** are connected to network **102**. In the preferred embodiment of the present invention, content providers **104** might be universities, colleges, foundations, private providers, corporations or an organization's institutional (or informal) knowledge database. Learning resource providers **106** may include providers that offer online libraries, textbooks, e-content, software or hardware, or financial aid or counseling. The aggregator **108** is also connected to network **102** along with storage database **110**. Clients **112** may be, for example, personal computers or network computers representing a student or corporate client networks with more than one individual client. For purposes of this application, a network computer is any computer coupled to a network, which receives a program or other application from another computer coupled to the network. Distributed data processing system **100** may also include additional servers, clients, and other devices not shown.

In the depicted example, distributed data processing system **100** is the Internet, with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, education, and other computer systems that route data and messages. Of course, distributed data processing system **100** also may be implemented as a number of different types of networks, such as, for example, an intranet, a local area network (LAN), or a wide area network (WAN).

1 **Figure 1** is intended as an example and not as an architectural limitation for the present  
2 invention.

3 **Figure 2** illustrates one embodiment of the computer architecture for the present  
4 invention. The aggregator **206** represents a link between content providers **202**, learning  
5 resource vendors **204** and clients **208**. Content providers **202** may be colleges,  
6 universities, foundations, private providers corporations, and organizations which provide  
7 downloadable content **208** for use by clients **210**. Learning resource providers **204** may  
8 be textbook companies, software or hardware providers, and financial institutions which  
9 provide financial aid for clients **210**. In the preferred embodiment, aggregator **206** is a  
10 service vendor which provides services to clients **210** seeking information and products  
11 pertaining to academic education. For example, aggregator **206** may provide clients **210**  
12 with information **208** and access to university curricula, degree plans, subjects, course  
13 schedules, textbooks, financial aid and academic or professional accreditation.

14 In alternative embodiments of the present invention, the aggregator **206** may take  
15 on numerous responsibilities and perform various functions. For example, if the client  
16 **210** is taking a distance learning program from a university that leads to a degree, he may  
17 want to transfer credits earned from a junior college to his present university. To  
18 accomplish this, the aggregator **206** can informally correlate the junior college courses to  
19 their equivalent courses offered by the university. It may also request the official  
20 transcript showing the junior college courses either from the client or that institution and  
21 formally request the transfer credits. This process might also be used to manage an  
22 employee's training record, an attorney's continuing legal education requirements or  
23 other similar data.

24 In a similar vein, the aggregator **206** can act as a credit facility. If the client **210**  
25 takes multiple distance learning courses from multiple providers, then the aggregator **206**  
26 can record those credits and provide a "transcript" for the client **210**. As the client **210**  
27 searches the multiple providers **202**, **204** for selections of either content products or  
28 services **208**, the aggregator **206** can also accumulate ratings from those clients **210** as to  
29 the quality and value of those offerings.

30 Another unique aspect of the present invention is the incorporation of a rewards  
31 program. The aggregator **206** can offer rewards to the client **210** for selection of



The rewards program might also be extended to the content and product vendors **202, 204**. The aggregator **206** may take a fixed percentage of any amount paid for either a course or a product. If a client **210** pays \$1000 for a course, the content provider **202** may be required to pay the aggregator **206** five percent (5%) of the proceeds. In an attempt to motivate the provider **202, 204** to list with only the one aggregator, that aggregator **206** might offer a reduction in this percentage. Alternatively, in an attempt to appeal to a special content provider, the aggregator **206** might offer to not list any directly competitive courses for a period of time. Alternatively, the aggregator **206** might offer to not list directly competitive courses for a higher fee.

Another unique aspect of this invention is its ability to aggregate formal knowledge, such as online classes, training and degree programs, with informal, or institutional knowledge. By extracting such informal knowledge from the knowledge management databases established by an organization, the remote agent can supply an end user with the organization's preferred manner of conducting its operations. These informal learning opportunities can be mixed with formal learning opportunities to provide a spectrum of knowledge acquisition from disparate data sources for the benefit of the user or user group.

With reference to **Figure 3**, the aggregator agent architecture **300** is depicted in further detail. Agent **306** is a proprietary software routine, such as the agent developed and owned by Digital E Holdings, Inc. of Austin, Texas, which is stored on the computer network composed of the databases, storage media, personal computers and servers of the

1 content provider **302** and the learning resource provider **304**. Agents can be classified as  
2 “remotely accessible” or “autonomous.” Remotely accessible agents are non-intrusive  
3 software routines that can retrieve data from a variety of disparate databases according to  
4 the instructions of a software routine known as a “controller.” Remotely accessible agents  
5 are also “bilingual” in that they can instruct a database on which the agent is placed to  
6 perform an instruction routine or complete some other requested task. The controller  
7 software generates a set of rules and standards for the agents to gather the information in  
8 a user request. Autonomous agents use the same set of rules and standards as the  
9 remotely accessible agents but are not placed within a third party database. Instead they  
10 retrieve data upon instruction from the controller and provide that data to the user after  
11 organization of the data by the controller. Upon receipt of search instructions from the  
12 aggregator **308**, the agent **306** searches the network database and storage mediums of the  
13 content provider **302** and/or the learning resource provider **304** for the information  
14 requested by the aggregator **308**. The agent search results are then transmitted to the  
15 aggregator **308** for further processing, which are then transmitted to the client **310**  
16 requesting the information.

17 Turning now to **Figure 4**, a flowchart depicting the utilization of the present  
18 invention is disclosed. Initially, the client has established an account with the aggregator  
19 which includes the client’s personal and billing information (**Step 402**). Access to the  
20 client’s account is controlled by a password or security protocol as is known in the art.  
21 The account may also include a personal record of the client’s credits and transcripts  
22 from each academic institution attended or accessed by the client. The client accesses his  
23 account with the aggregator and inputs a search query pertaining to information the client  
24 desires to find (**Step 404**). The aggregator transmits the search query to the remote  
25 agents (**Step 406**) located on the content provider and learning resource provider  
26 networks which then begin searching in real time for the requested information (**Step**  
27 **408**). The agents transmit the results of the search query to the aggregator for processing  
28 using rules and standards as expressed by the end user or end user group. (**Step 410**). For  
29 instance, the aggregator may process the search results by analyzing and culling  
30 information which is not relevant to the query posed by the client and then transmitting  
31 the condensed information to the client (**Step 412**). Alternatively, the aggregator may not

1 analyze the agent search results and simply transmits the search results on to the client for  
2 processing.

3 **Figure 5** is an alternative embodiment of the invention disclosed herein which  
4 allows the client to retrieve customized forms of information as specifically requested by  
5 the client. For example, the client may wish to view a degree plan or "course map" of the  
6 various online or distance learning courses he or she will need to complete in order to  
7 obtain a degree in zoology with a specialization in primates. Course content will have to  
8 be obtained from several institutions to provide the degree. Initially, the client accesses  
9 his or her account with the content aggregator (**Step 502**). Next, the client inputs the  
10 appropriate query or commands instructing the aggregator to assemble a course map of  
11 academic courses available from various academic content providers which are required  
12 for a zoology degree (**Step 504**). The aggregator transmits the appropriate commands to  
13 the remote agents located on various content provider databases and to autonomous  
14 agents located outside of such databases to search and retrieve information on zoology  
15 courses offered by each content provider (**Step 506**). After the software agents complete  
16 their search and collection of information and courses related to zoology at each content  
17 provider, the agents transmit the collected information to the aggregator for processing  
18 (**Step 508**). The aggregator processes the information by methods known in the art for  
19 categorizing and organizing electronic information according to a selected variable, such  
20 as course prerequisites, course availability, course title, course location, course length,  
21 course credit and course tuition cost (**Step 510**). This categorization and organizational  
22 analysis enables the client to create a degree plan selected from a variety of courses  
23 offered by different content providers and in effect, create a custom course map degree  
24 plan based on course offerings from a single or multiple content providers. The  
25 aggregator then transmits the processed information to the client which presents the  
26 courses the client will need to complete to receive a specialized degree in zoology (**Step**  
27 **512**).

28 **Figure 6** is another example of an alternative embodiment of the present  
29 invention in which the client instructs the aggregator to locate and assemble specific  
30 subject content from a variety of networked content and learning resource providers.  
31 Once the client has accessed his or her account with the aggregator (**Step 602**), the client

1 enters a query instructing the aggregator to collect information on a specific topic, such  
2 as roman architecture (**Step 604**). The aggregator transmits the query to the remote  
3 agents located on the content provider and learning resource provider networks and  
4 databases (**Step 606**). The remote agents poll and collect information on roman  
5 architecture from a variety of sources, including but not limited to, architectural design  
6 classes, architectural product suppliers, architectural historical associations, and other  
7 architectural databases and then transmit the collected content to the aggregator for  
8 processing (**Step 608**). The aggregator categorizes the content in the format specified by  
9 the client where, in this example, the client is provided with a list of various sources with  
10 content directed towards roman architecture which may include the blueprints of the  
11 coliseum from an archive, an online course on the impact of roman architecture in the  
12 development of civilization, and plastic model reproductions of roman columns or,  
13 perhaps, what a colleague within the user's organization may have recorded regarding  
14 roman architecture upon the organization's database. The aggregator can also sort  
15 through online educational content that can be accessed at a submodular level (for  
16 example, a chapter of a textbook in electronic format) to create content that, when added  
17 together, comprise a customized online course in roman architecture from various content  
18 providers for that particular user or user group. Textbooks, course content, graphical  
19 images, and other accessible data can be pulled from to create customized content. (**Step**  
20 **610**). The aggregator then transmits the processed content to the client (**Step 612**).

21 The matters set forth in the foregoing description and accompanying drawings are  
22 offered by way of illustration only and not as limitations. Other applications and  
23 variations of the invention disclosed herein will become evident to those skilled in the art.  
24 The actual scope of the invention is intended to be defined in the following claims when  
25 viewed in the proper perspective based on the relevant prior art.